Acute flaccid paralysis

Sudden onset of weakness or paralysis in a previously normal limb over a period of 15 days in a patient aged less than 15 years age(LMNL)

Flaccid = absence of signs of CNS lesion as hypertonia or hyper reflexia, clonus, extensor planter reflex.

AE:

1. Brain stem		Stroke and encephalitis.
2. Spinal cord		-Demyelinating diseases -Transverse myelitis -Cord→ compression, stroke ,tumour ,trauma, Ischaemic damage. -Paraspinal abscess -Haematoma -Vascular malformation with -Thrombosis/bleeding
3. A.H.C		-Poliomyelitis & Non polio (enterovirus, herpes) -Vaccine-associated paralytic polio
4.Peripheral nerves	**Unilateral**	-local trauma - Focal mononeuropathy
	Bilateral	- Guillain Barré syndrome - toxic →→heavy metals, snake toxin. - infectious →diphtheria.
5.Neuromuscular transmission disorders		- Myasthenia gravis. - Botulism. - Insecticide (organophosphate poisoning) - Tick paralysis. - Snake bite
6.Muscular disorders		- Inflammatory myopathy. - Viral myositis. - Periodic paralysis - toxic myositis (blocking agents) - Mitochondrial diseases (infantile type)
7- Systemic disease		-Acute porphyrias -Critical illness neuropathy

Investigations:

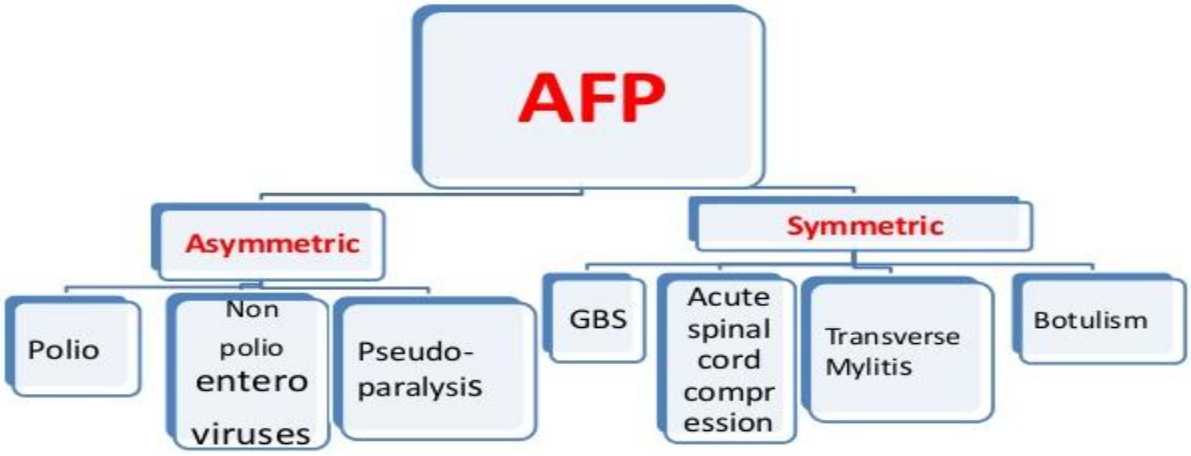
- MRI.
- CSF →→ infections
- NCV→→↓↓
- EMG→→ Denervation pattern.
- CK→ Realeased after damage or denervation of muscles.

Features assisting diagnosis

- Age.
- A history of preceding or warning illness.
- A history of trauma.
- The presence (at time of paralysis) of fever.
- Rapidity of progression.
- Cranial nerve findings, and sensory findings.
- The Examination should include a search of fracture , focal tenderness or swelling and painful limping gait.
- The examination may show UMNL signs

✓ increased reflexes
✓ Hypertonicity
✓ a positive Babinski sign.

- Laboratory findings occasionally are diagnostic



	Polio	**Guillain Barré syndrome**	**Traumatic neuritis**	**Transverse myelitis**
Onset	24-48 hrs	hrs- 10 days	hrs- 4days	hrs- 4days
Fever	High at onset	Not common	Common before, during and after FP	Rare
Flaccid paralysis	Acute Asymmetrical Proximal(++)	Acute symmetrical Distal(++)	Acute Asymmetrical One limb(++)	Acute symmetrical LL
Muscle tone	↓↓/ absent in affected limb	Global hypotonia	↓↓/ absent in affected limb	LL hypotonia
Deep tendon reflex	↓↓/ absent	Global absent	↓↓/ absent	Early → absent in LL Later→hyperreflexia
Sensation	Myalgia+ back pain No sensory changes	Cramps, tingling, hyposethia in palms& soles	local pain, hypothermia	LL anaesethia+ sensory level
Cranial nerves	If bulbar involvement	+++(vii,ix,x,xi,xii)	No	No
Respiratory involvement	If bulbar involvement	In sever cases	No	**±**
Autonomic manifestations	Rare	+++	Hypothermia in affected limb	++
CSF	Inflammatory	Cytoalbuminous dissociation	Normal	Normal or mild ↑ in cells
Bladdar dysfunction	No	Transient	No	Present
NCV	Normal during 1st 2 Ws then ↓↓	↓↓	↓↓	**±**
EMG	Abnormal	Normal	Normal	Normal
sequel	Sever asymmetrical atrophy→skeletal deformity	symmetrical atrophy of distal ms	Moderateatrophy in affected limb	Flaccid diplegia→ atrophy after yrs

Ataxia

- Incordination of voluntary movements in absence of motor lesions(weakness/ paralysis).

Types:

1-Cerebellar ➔+++.
2-Sensory➔Posterior column affection (deep sensory loss).
3-Vestibular➔Acute labrynthitis as a complication of OM.
4- Hysterical.
5- Combined.

	Sensory	**Vestibular**
Ae	Lost proprioceptive sensations(deep): 1- Peripheral nerves: polyneuropathy. 2- Dorsal root:tabes dorsalis 3- Posterior column: subacute combined spinal cord degeneration(↓↓ vit B12),,, Fredrichs ataxia. 4- Lesions : thalamic, parietal lobe.	Lesion in vestibular system: 1-labrynthitis. 2- acoustic neuroma. 3-vestibular neuritis. 4-Vascular lesions.
C/P	1- Kinetic tremors on eye closure(finger to finger test). 2- Deep sensory loss. 3- Romberg test→→+ve. 4- Gait →→ stamping. 5- Hypotonia 6- Hyporeflexia.	1-Ataxia. 2-Vertigo 3-Nystagmus 4-Tinnitus 5-Hearing loss 6-Caloric test→+ve

Cerebellar ataxia

C/P: Manifestations occur at same side of lesion.

1. **Gait disturbance:**
   -Archi-cerebellar lesions→→ (broad base/ drunken).
   -Neo-cerebellar lesion(unilateral→ deviation to the same side,,,,bilateral→→zigzag).
2. **Incordination of skilled movements**.
   - Limb ataxia.
   - Trunkal ataxia (titubation).
   - Head nodding
   - Rebound phenomenon.
   - Stacatto speech (dysarthria).
   - Dysdiadokinesia.
   - Nystagmus (mainly horizontal).

   -Positive tests for coordination
   - Finger to finger,,,,,,,,,Finger to nose,,,,,,,,,,Finger to doctor,,, buttoning & unbuttoning,,,,, supination& pronation,,,,, heel to knee.

   -Each showing ➔Dysmetria (either hypo or hypermetria).
   ➔Decomposition of movements.
   ➔Kinetic tremors.
3. **Hypotonia & hyporeflexia(** pendular knee reflex**)**.
4. **+ve Romberg sign ➔**sensory ataxia, rare in children.

AE:

Acute(recurrent chorea)	Chronic(progressive chorea)
1-Inflamatory(infections). **i-<u>Acute cerebellar ataxia (cerebellitis).</u>** ➢ **<u>AE</u>**: autoimmune demyelination in response to viral infection (VZV-cox -echovirus). ➢ **<u>Age</u>** : 1-3 yrs ➢ acute ataxia, Regressive coursewith preceeding viral infection(2-3 ws). (No fever-No meningial irritation-No↑↑in ICT). ➢ **<u>Diagnosis</u>**: by exclusion (CSF is usually normal & rarely may show ↑↑protein after few wks). ➢ **<u>Prognosis :</u>** complete recovery in most cases within few wks - mons few cases may show residual incoordination. **ii-<u>Bacterial ataxia.</u>** ➢ complication of bacterial meningitis,OM , cerebellar abscess, Diphtheria or pertussis. ➢ There is high fever ,meningial irritation signs +↑↑ ICT. ➢ CSF & CT are diagnostic. **iii-<u>Cerebellar abscess.</u>** **iv- <u>Brain stem encephalitis.</u>** **2-Toxic**: Lead,,,Alcohol,,,Phenytoin. **3-Traumatic**. **4-Brain trs**.→should be excluded in any child with ataxia. **5-Vascular**→ cerebellar hge. **6-Migraine.** **7-Genetic disorders:** AD ataxia, episodic ataxia. **8-Familial paroxysmal ataxia**→→AD ➢ Recurrent episodes of acute ataxia starting in the 1st 2 yrs with ↑↑in severity (the attack may last for few days).	**1-Congenital anomalies.** i-Agenesis of cerebellar vermis. ➢ Presents in early infancy with mental retardation & hypotonia. ➢ Manifestation of ataxia do not appear before the 1st year. ➢ Non progressive ➢ MRI & CT are diagnostic. ii- cerebellar aplasia iii-Dandy walker syndrome. iv-Chiari malformations. **2-Brain trs**→astrocytoma, medulloblastoma **3-Ataxic CP.** **4-Hereditary:** -Friedreich ataxia. -Ataxia telangectasia. -Degenerative brain diseases(gry & white matter→Metachromatic leukodystrophy. **5-Metabolic.** I-Abeta-lipoproteinemia. **C/P:** -FTT, steatorrhea, rickets, ataxia, PN, deep sensory loss, rhinitis pigmentosa **TTT:** medium chain TGs, vit AKED. II-Refsum disease. III-Hartnup disease. IV - ↓Vit E. V- Gaucher& Neiman pick disease(type 3) VI-Maple syrup urine disease.

Friedreich ataxia(AR).

Pathology	**Degeneration of :** Cerebellum + 3P 1- Posterior column & spinocerebellar tract. 2- Pyramidal tract. 3- Peripheral nerves. 4- Cardiac muscle (interstitial myocarditis).
C/P	-Age →→10-12 years. -Onset→→ Gradual -Course→→slowly progressive -Cerebellar manifestations:Ataxia (discus). -Post column: deep sensory loss & +ve Romberg sign. -Pyramidal tract:hypertonia,hyperreflexia (masked), Babiniski+ve. -Periphral nerves: hypotonia ,hyporeflexia(lost ankle preserved knee) , stock & glove hyposthesia. -Cardiac muscle: cardiomegaly ,arrhythmia & HF -Others : pes cavus-scoliosis.
Diagnosis	-Clical→→Ataxia ,+ve babiniski & absent ankle (pathognomonic). -ECG-Echo. -NCV.
Prognosis	Progressive ataxia & death →→HF
TTT	No effective treatment.

Ataxia telangiectasia(AR)

Ataxia = cerebellar degeneration.

Telangectasia = dilated vessels of conjunctiva ,nasal bridge & nasolabial folds, ears.

Characters:

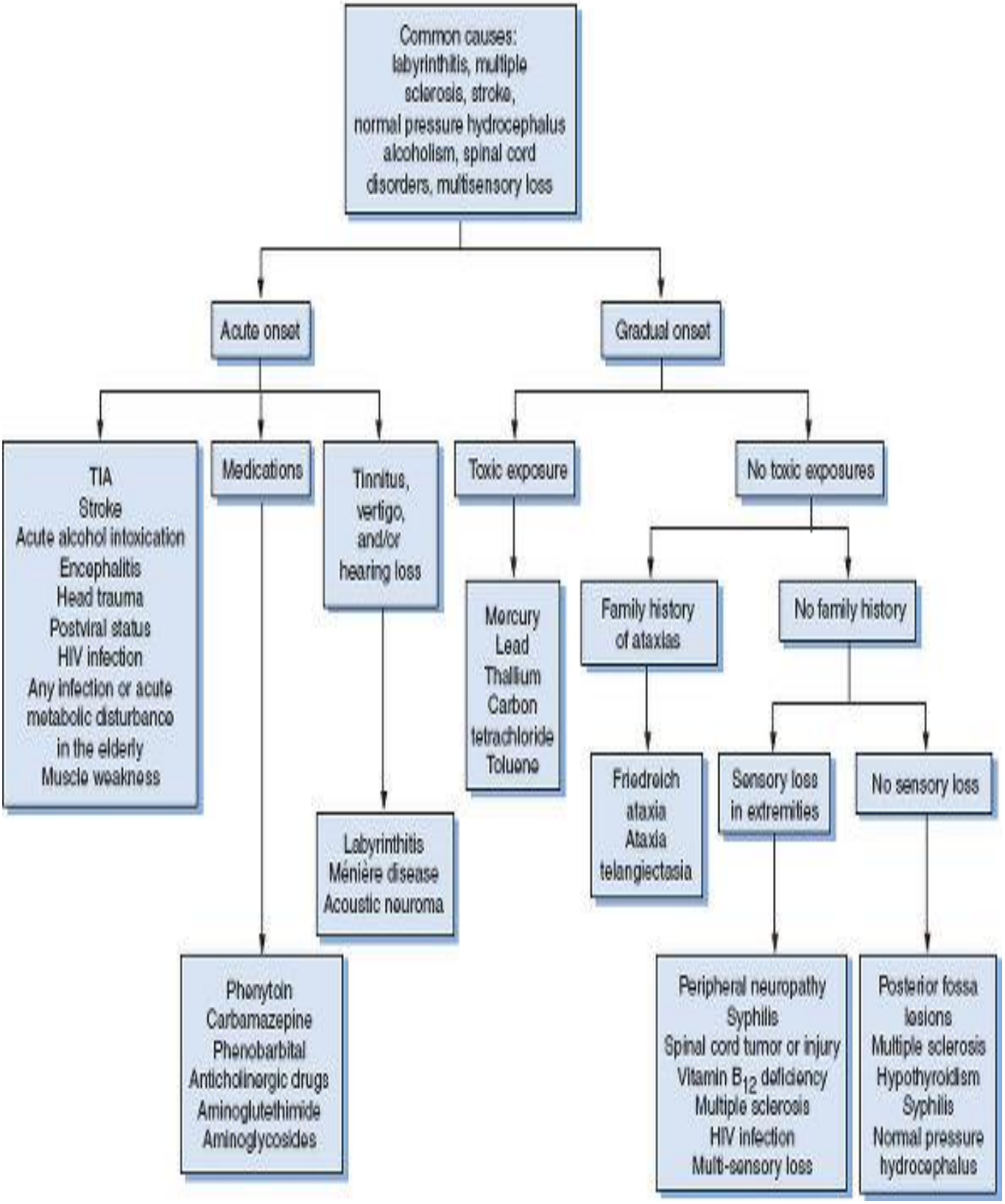
1- Immune dysdfunction (T & B)
2- ↓↓ cell mediated immune response.
3- ↓↓ Igs especially A&G.
4- ↑↑Afp.

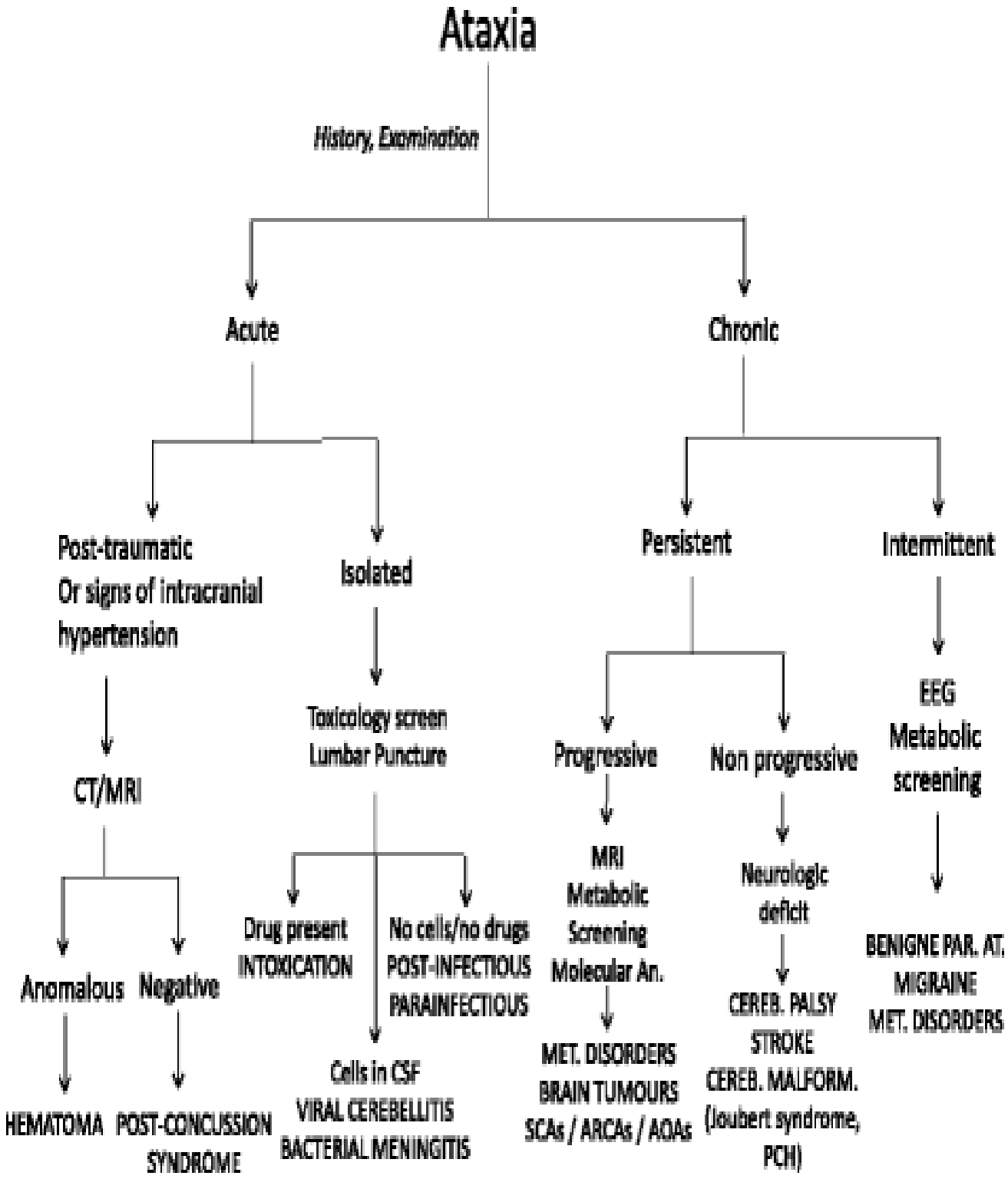
Complications:

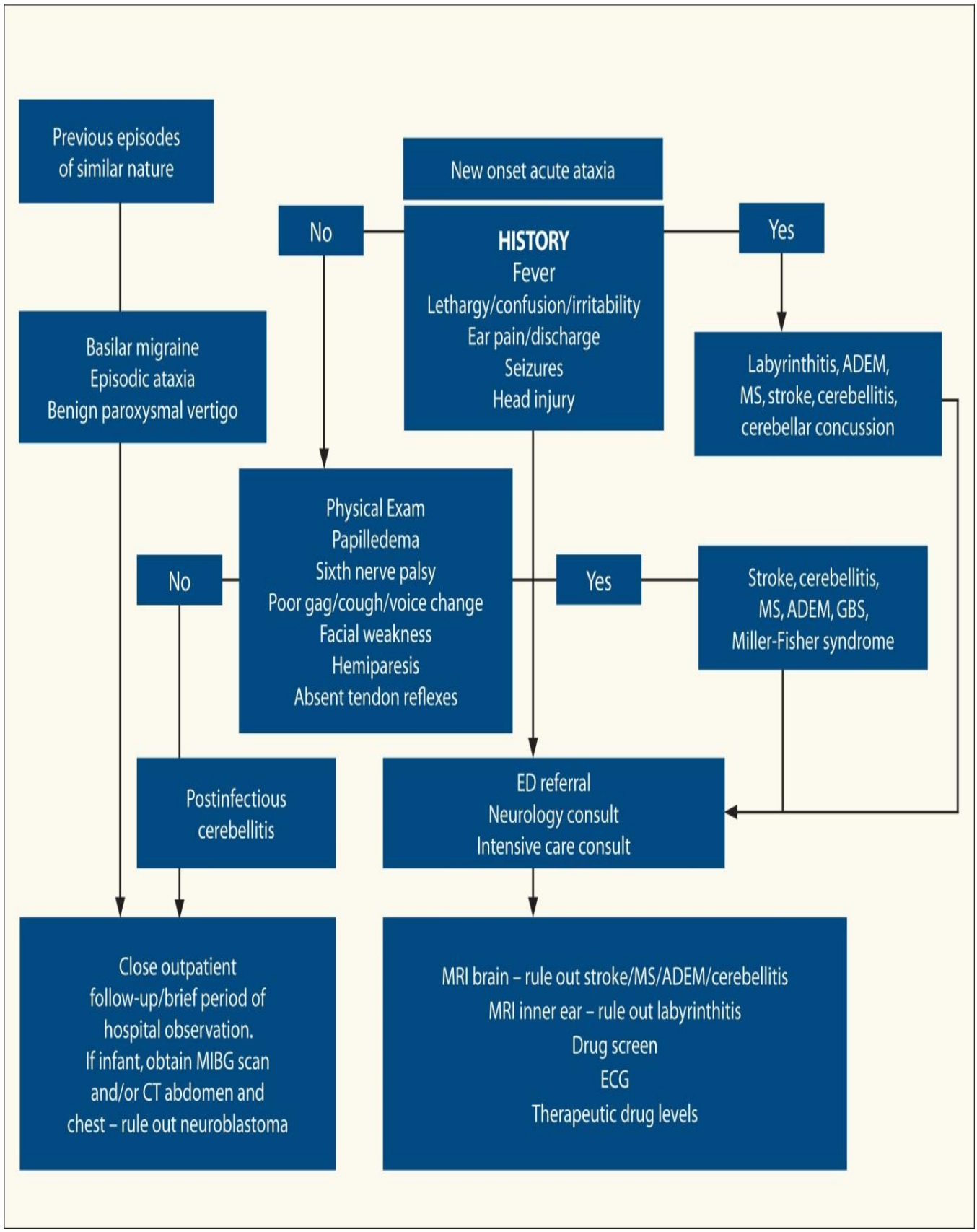
1- repeated chest infections & bronchiectasis.
2- Mg →→ ↑↑ chromosomal breaks(14) e.g. lymphomas & brain tumors.

Prognosis: very poor death in early childhood from pulmonary infections or Mg.

ATAXIA


Common causes: labyrinthitis, multiple sclerosis, stroke, normal pressure hydrocephalus alcoholism, spinal cord disorders, multisensory loss
Acute onset
Gradual onset
TIA
Stroke
Acute alcohol intoxication
Encephalitis
Head trauma
Postviral status
HIV infection
Any infection or acute metabolic disturbance in the elderly
Muscle weakness
Medications
Tinnitus, vertigo, and/or hearing loss
Toxic exposure
No toxic exposures
Mercury
Lead
Thallium
Carbon tetrachloride
Toluene
Family history of ataxias
No family history
Labyrinthitis
Ménière disease
Acoustic neuroma
Friedreich ataxia
Ataxia telangiectasia
Sensory loss in extremities
No sensory loss
Phenytoin
Carbamazepine
Phenobarbital
Anticholinergic drugs
Aminoglutethimide
Aminoglycosides
Peripheral neuropathy
Syphilis
Spinal cord tumor or injury
Vitamin B_{12} deficiency
Multiple sclerosis
HIV infection
Multi-sensory loss
Posterior fossa lesions
Multiple sclerosis
Hypothyroidism
Syphilis
Normal pressure hydrocephalus


Ataxia
History, Examination
Acute
Chronic
Post-traumatic
Or signs of intracranial
hypertension
Isolated
Persistent
Intermittent
CT/MRI
Toxicology screen
Lumbar Puncture
Progressive
Non progressive
EEG
Metabolic
screening
Anomalous
Negative
Drug present
INTOXICATION
No cells/no drugs
POST-INFECTIOUS
PARAINFECTIOUS
MRI
Metabolic
Screening
Molecular An.
Neurologic
deficit
BENIGNE PAR. AT.
MIGRAINE
MET. DISORDERS
HEMATOMA
POST-CONCUSSION
SYNDROME
Cells in CSF
VIRAL CEREBELLITIS
BACTERIAL MENINGITIS
MET. DISORDERS
BRAIN TUMOURS
SCAs / ARCAs / AOAs
CEREB. PALSY
STROKE
CEREB. MALFORM.
(Joubert syndrome,
PCH)


Previous episodes of similar nature
New onset acute ataxia
No
HISTORY
Fever
Lethargy/confusion/irritability
Ear pain/discharge
Seizures
Head injury
Yes
Basilar migraine
Episodic ataxia
Benign paroxysmal vertigo
Labyrinthitis, ADEM, MS, stroke, cerebellitis, cerebellar concussion
Physical Exam
Papilledema
Sixth nerve palsy
Poor gag/cough/voice change
Facial weakness
Hemiparesis
Absent tendon reflexes
No
Yes
Stroke, cerebellitis, MS, ADEM, GBS, Miller-Fisher syndrome
Postinfectious cerebellitis
ED referral
Neurology consult
Intensive care consult
Close outpatient follow-up/brief period of hospital observation.
If infant, obtain MIBG scan and/or CT abdomen and chest – rule out neuroblastoma
MRI brain – rule out stroke/MS/ADEM/cerebellitis
MRI inner ear – rule out labyrinthitis
Drug screen
ECG
Therapeutic drug levels

Clinical differences between sensory and cerebellar ataxia

	Sensory ataxia	Cerebellar ataxia
Nystagmus	Absent Except sensory ataxia-plus syndromes	Present
Dysarthria	Absent	Scanning/staccato speech
Eye movements	Sometimes abnormal (eg, CANOMAD)	Normal/slow
Finger–nose ataxia	Present (significantly worse with eye closure)	Present

Cerebral Palsy

Definition:

3 Non (progressive, fatal, curable) disorder of the C.N.S. resulting from any major insult before full maturity of C.N.S occurs →→prenatal, natal or post natal.

Characterized by:

1.Motor disability.

2.Manifestations of organic brain damage →→Seizures, MR, learning deficits, sensory behavioral and emotional disturbances.

AE:

I.Prenatal	-Cerebral malformations -Placental insufficiency⇒ severe fetal anoxia. -Maternal: - infections (TORCH) - pelvic irradiation - drug or alcohol intake.
II.Natal	-Asphyxia -Birth injuries -Preterm →↑ risk of → asphyxia, birth injuries and RDS.
III.Post natal	-CNS: - infections: -meningitis- encephalitis - trauma -Cerebrovascular accidents -Hypoxia as in asphyxia & shock -Metabolic disorders as hyponatremia and hypoglycemia -Post kernicterus.

Classifications:

I. cause:post encephaletic or post kernicteric(if known).

II. anatomic distribution:

1-Monoplegia → one limb
2-Hemiplegia → one side
3-Diplegia → asymmetrical affection of 4 limbs more in the LL.
4-Quadriplegia → symmetrical affection of 4 limbs
5-Paraplegia → symmetrical affection of both LL.

III. type:

1.Spastic: the commonest 70%

-Damage in pyramidal area (motor cortex)

-Hypertonia (clasp knife)

-Hyperreflexia, ankle clonus & extensor planter response.

-May be hemiplegic,quadriplegic or diplegic.

2.Athetoid:(Dyskinetic or Dystonic),10%

-Affection of basal ganglia.

-Irregular, involuntary movements .

3.Ataxic:10%

-Damage to the cerebellum

-Weakness, hypotonia, incoordination and intentional tremors

4.Atonic (cerebral infantile hypotonia)

Floppy infant

5.Mixed

IV.According to functional state:

Class I: no limitation of activity

Class II: slight to moderate limitation

Class III: moderate to severe limitation

Class IV: no useful physical activity

V.According to associated deficits:

-MR

-Convulsions

-Microcephaly

-Behavioral disorders

-Hearing, speech , visual deficits or any cranial nerve palsy.

Clinical picture:

-Delayed motor development (any gross deviation from normal).

-Persistence of neonatal reflexes more than 6 months.

-Most of them suffer from feeding difficulties (psuedobulbar palsy).

clinical diagnosis should include type,degree of functional disability, associated neurological findings& cause of CP.

DD:

Other causes of→→ floppy infant,,,,,,,,spasticity.,,,,,,,,,,,,,,ataxia.

Investigations:

-CT→ site& extent of lesion- brain atrophy or malformations.

-EEG

-**Lab**:TORCH- Metabolic screening, sr. electrolytes.

Treatment:

It is irreversible brain damage so there is only

1.Rehabitilation.

2.Physiotherapy to avoid contrctures.

3.Control of convulsions

Floppy infant

Definition

↓↓ in muscle→ tone (hypotonia), power (weakness) or a ligamentous laxity →→↑↑range of joint mobility since birth or shortly after.

Clinically

- **Frog leg position**: in supine position→→ abduction &flexion of limbs. = hypotonia of limb muscles.
- **Head lag**: in supine position= hypotonia of neck muscles.
- **Curved trunk (U shaped) on ventral suspension**= hypotonia of trunk muscles

AE:

Central	1. HIE 2.IC Hge 3.Kernicterus 3. Cerebral malformations 4.Atonic CP. 5.familial dysautotonia 6- Lowe syndrome→ oculocerebrorenal s 7. Chromosomal diseases(Tri21, Prader-Willi S) 8.Peroxisomal→Zellweger s(cerebro-hepato-renal). 6. Congenital & acquired infections 7. Others ➔Leukodystrophies ➔ Drugs→ Benzodiazepines, Mg toxicity
Peripheral	1. Spinal muscle atrophy 2. Congenital → myopathy ,,,muscle dystrophy 3. Glycogenosis type II 4. Myasthenia→ congenital, transient 5. Benign congenital hypotonia (idiopathic, non progressive hypotonia in otherwise normal infant) 6. Peripheral nerves→ Hereditary motor and sensory neuropathies(Guillain Barre syndrome). 7.Metabolic myopathies →→Acid maltase deficiency,Carnitine deficiency, Cytochrome-c-oxidase deficiency. 8. Mitochondrial myopathies 9. infantile botulism
N.B: Other causes with floppiness. **-Sepsis,,,,,,,,,,,,,Jaundice ,,,,,,,,,,,,,,Hypoglycaemia ,,,,,,,,,,,,Hypothyroidism**	

Diagnostic approach:

1-History:

Family Hx	affected parents/siblings, consanguinity, stillbirths, childhood deaths.
Maternal disease	myotonic dystrophy (hand shake), epilepsy,DM.
Pregnancy	Drug/ teratogen exposure, fetal movements, poly/ oligohydramnios, abnormal fetal presentation in-utero.
Neonatal	• Apgar scores • Resuscitation requirements • Cord gases • Respiratory effort •Ability to feed • Level of alertness •spontaneous activity •Character of cry

2-Exam:

1- Dysmorphic features and asymmetry.
2- Assess muscle tone, the infant's strength and deep tendon reflexes .
3- Other: arthrogryposis, talipes, feeding difficulties, weak cry, respiratory failure, HSM (storage disease, congenital infections), undescended testes (PraderWilli).

Specific signs:

Hepatosplenomegaly	storage disorders, congenital infections
Renal cysts, high forehead, wide fontanelles	Zellweger's syndrome
Hepatomegaly, retinitis pigmentosa	neonatal adrenoleukodystrophy
Congenital cataracts, glaucoma	Lowe syndrome
Abnormal odor	metabolic disorders
Hypo pigmentation, undesceded testes	Prader Willi

Examination of the mother is also important in suspected cases of congenital myotonic dystrophy or myasthenia gravis.

Weakness is uncommon in central hypotonia except in the acute stages. Arthrogryposis (the fixation of joints at birth) may be associated with neonatal hypotonia, more commonly with LMNL or multisystem abnormalities.

3-Investigations→→depending on Hx and C/P:

Central (Hypotonic + a degree of strength + dysmorphic facies+ seizures± disturbed conscious level)	**Peripheral** (Hypotonic +fasciculations+ weak)
• US,,,,CT,,,,MRI • EEG: • Karyotype (dysmorphic features) • TORCH screen • Metabolic workup	• Molecular genetics • CK(Creatine kinase) : levels need to be interpreted with caution in the newborn, as levels tend to be high at birth and increase in the first 24 hrs, they also increase with acidosis). If elevated in an early sample, repeat after a few days. • NCV& muscle biopsy (Depending on clinical situation, may be delayed until around 6 months of age as neonatal results are difficult to interpret)

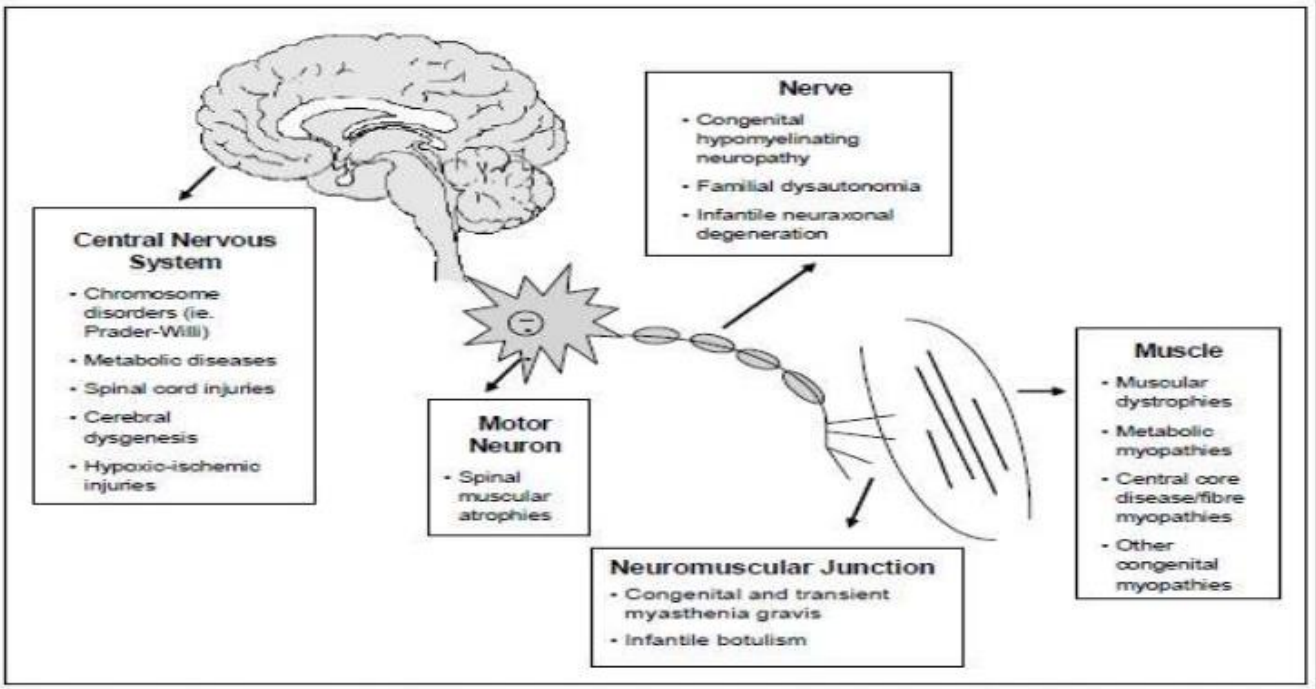
Others:

-Serum electrolytes→→Ca, phosphate, ALP.
- ABG
-Thyroid function
-Chromosomal analysis& Genetic testing (SMA, myotonic dystrophy)
-Genetics: pre-natal diagnosis and counselling for future pregnancies.

4-Management:

1- Physiotherapy	aimed at preventing contractures.
2- Occupational therapy	improvement of posture and function, facilitating daily activities.
3- Evaluation and treatment of associated cardiac dysfunction.	
4- Respiratory support	invasive or non-invasive ventilation and/or tracheostomy. TTT of respiratory infections.
5-Feeding	nasogastric feeding, caloric supplementation, gastrostomy.
6- Gastro-esophageal reflux	medical or surgical(fundoplication).
7-Orthopaedic intervention	prevention and correction of scoliosis and joint contractures.
7- Encouragement	development ,,,,, learning.
8- vaccination	influenza ,,,,,, pneumococcal

Common causes of hypotonia



Differentiating Features of a Floppy Infant according to Site of Involvement *(Contd.)*

Site of involvement	Deep tendon reflexes	EMG	Muscle biopsy
Central	Normal or increased	Normal	Normal
Anterior horn cell	Absent	Fasciculation / fibrillation	Denervation pattern
Peripheral nerve	Decreased	Fibrillation	Denervation pattern
Neuromuscular junction	Normal	Decremental / incremental	Normal
Muscle	Decreased	Short duration small amplitude potential	Characteristic

Upper Motor Neuron (UMN) vs. Lower Motor Neuron (LMN) Syndrome

	UMN syndrome	***LMN Syndrome***
Type of Paralysis	***Spastic Paresis***	***Flaccid Paralysis***
Atrophy	**No (Disuse) Atrophy**	**Severe *Atrophy***
Deep Tendon Reflex	***Increase***	**Absent DTR**
Pathological Reflex	**Positive *Babinski* Sign**	**Absent**
Superficial Reflex	**Absent**	**Present**
Fasciculation and Fibrillation	**Absent**	**Could be *Present***

Guillain barre syndrome

Post infectious polyneuropathy➔demyelination of peripheral nerves mainly motor.
AE →→may be an immune reaction 2ry to →viral (EBV, influenza)
or bacterial → campylobacter.

Pathology:
Demyelination →→myelnopathy
Degeneration of axon →→axonopathy

C/P→→Gradual onset, progressive course.

1-Febrile stage		URTI or GE.
2-Latent stage		10-15 ds after febrile stage
3-Paralytic stage	**Motor**	LMN weakness (hypotonia-hyporeflexia) ascending & symmetrical start in LL⇒trunk & UL ± respiratory musles →RF
	Sensory	pain & tenderness in calf muscles ± paresthesia.
	Sphincters	intact ±transient urinary incontinance or retention
	Cranial nerves	Bulbar involvement in 50% of cases commonly in the form of dysphagia.
	Autonomic	bradycardia & postural hypotension.
	Others	respiratory tract infections (respiratory muscle affection).
Miller –fisher syndrome →→ Areflexia - Ataxia - Ophthalmoplegia.		

Investigations :

CSF	Cyto-albuminous dissociation after 2 wks.(↑↑proteis with no↑↑ in cells)
NCV	↓↓
EMG	Acute muscle denervation.
Serology	campylobacter jejuni, mycoplasma.

TTT:

Acute phase	Chronic cases
1. Hospitalization →→ observe vital signs & progress of weakness. 2. Supportive ➔antibiotics, MV & care of paraplegia & balbar weakness. 3. Active treatment➔for severe & progressive cases ○ Steroids. ○ IVIG→ *400 mg/kg/day*. ○ Plasmapharesis.	- IVIG : 400 mg/Kg/day. - Plasmapheresis - Steroids are effective.

Prognosis:

- Complete recovery →→85% of patients in 2-3 wks in descending manner.
- Residual weakness i→→10%.

Causes of bad prognosis:
1- Cranial nerve affection.
2- Bulbar symptoms.
3- Intubation.
4- Maximum disability.

Cause of death→→ Respiratory failure.

Periodic paralysis

It is a condition characterized by episodes of flaccid muscle weakness (myopathy) occurring at irregular intervals associated with transient alternations in serum potassium levels, usually hypokalemia but may be hyperkalemia.

AE:

<table>
<tr><th>Heridetary(+++)</th><th colspan="2">Nonhereditary</th></tr>
<tr><td rowspan="2">Mutations in genes encoding voltage-gated ion channels in muscle(Na, Ca, K)
Hypokaemic form in
-Andersen S
-Tawil syndrome
-paramyotonia congenita (PMC) (AD).</td><td colspan="2">Disorders that affect K balance:</td></tr>
<tr><td>↓↓ K</td><td>↑↑K</td></tr>
<tr><td></td><td>-Thyrotoxicosis
-1ry hyperaldosteronism (Conn syndrome)
-Renal tubular acidosis (Fanconi syndrome)
-Juxtaglomerular apparatus hyperplasia.
(Bartter syndrome)
-Laxative abuse
-Pancreatic non–insulin-secreting trs
-diarrhea
-Barium intoxication
-Potassium-depleting diuretics
-Amphotericin B
-Corticosteroids</td><td>-Addison disease
-Hypoaldosteronism
-Excessive potassium supplementation
-Potassium-sparing diuretics
-Chronic renal failure</td></tr>
</table>

C/P:

-Attacks of muscle weakness & inability to move on awakening from sleep followed by gradual improvement of muscle strength within few minutes. All 4 extremities are involved.

-Between attacks→→ normal

-Hyperkalemic form→ common in infancy& nearly always symptomatic by 10 yrs of age.

- Female = males

- Hypokalemic form, Andersen-Tawil syndrome, and paramyotonia congenita. → Late childhood or adolescence.

-The usual frequency of attacks in childhood is once a week.

Invesigations: during acute episodes.

- ECG: T-wave changes(Alterations in Sr. K)
- CK→ mildly elevated
- Sr.Ph→ ↓↓
- Muscle biopsy: vacuolar myopathy (normal between attacks).

TTT:

-hypokalemic periodic paralysis→→oral K + K containing fruit juices.

-↓↓ Na intake + giving acetazolamide(125-250 mg bid or tid) in school-age children→→↓↓ frequency and severity.

-Spironolactone(100-200 mg/day PO) in school-age children.

Pseudo-tumour cerebri

Idiopathic intracranial hypertension (IIH)

Def:

Disorder characterized by ↑ ICP ≥280 mm Hg in sedated or obese children; ≥250 mm Hg in nonobese, nonsedated children with a normal CSF (cell , protein) , normal ventricular (size, anatomy and position) documented by MRI. The most important neurologic manifestation is papilledema →→progressive optic atrophy →→ blindness.

Pathophysiology

Alterations in CSF absorption and production, abnormalities in vasomotor control and cerebral blood flow, and venous obstruction.

AE:

IDIOPATHIC	
HEMATOLOGIC	Wiskott-Aldrich syndrome Iron-deficiency anemia Aplastic anemia Sickle cell disease Polycythemia Bone marrow transplantation Prothrombotic states Fanconi anemia
INFECTIONS	Acute sinusitis Otitis media (lateral sinus thrombosis) Mastoiditis Tonsillitis Measles Roseola Varicella, recurrent varicellazoster Lyme disease HIV or associated treatment complications?
DRUGS	Tetracyclines Sulfonamides Nalidixic acid Fluoroquinolones Corticosteroid therapy and withdrawal Nitrofurantoin Cyclosporine Phenytoin

RENAL	Nephrotic syndrome Peritoneal dialysis
NUTRITIONAL	Hypovitaminosis A Vitamin A intoxication Vitamin D–dependent rickets
CONNECTIVE TISSUE DISORDERS **ENDOCRINE**	Antiphospholipid antibody syndrome Systemic lupus erythematosus? Behçet disease Menarche Polycystic ovarian syndrome Hypothyroidism, Hypoparathyroidism/ hyperparathyroidism Congenital adrenal hyperplasia Addison disease Recombinant growth hormone
OTHER	Dural sinus thrombosis Obesity (in pubertal patients) Bariatric surgery Head trauma Superior vena cava syndrome Arteriovenous malformation Sleep apnea Guillain-Barré syndrome Crohn disease Ulcerative colitis? Turner syndrome

Clinical manifestations

Patients with pseudotumour cerebri present with symptoms of increased intracranial tention and papilledema which include the following:

- Chronic (weeks to months), progressive, frontal headache
- Non specific symptoms :nausea,vomiting, photophopia.
- Diplopia usually horizontal due to 6th nerve palsy
- Pulsatile tinnitus
- May be rarly asymptomatic

Visual symptoms of Papilledema may include:

- transient visual obsurations
- progressive loss of of peripheral vision in one or both eyes-

- blurring and distortion of central vision due to macular edema and optic neuropathy-
- sudden visual loss.
- The most important physical finding showed by ophthalmologist is bilateral optic disc edema.

Infant: No papilledema. Pulging anterior fontanelle and a "cracked pot sound" (percussion of the skull produces a resonant sound) resulting from separation of the cranial sutures.

Lab investigations in suspected patients:

- CBC
- Electrolytes&ABG
- Coagulation profile
- Neuro imaging: any patient suspected of pseudotumor cerebri should undergo CT and MRI of the brain to rule out any intracranial lesion.
- Lumber puncture: CSF analysis

Treatment

- AE.
- The obese →→weight-loss regimen,
- Several lumbar taps →removal of sufficient CSF to reduce the opening pressure by 50% occasionally lead to resolution of the process.
- **Pharmacological ttt**: Acetazolamide,10-30 mg/kg/24 hr,↓↓ICP-Corticosteroids for short time- amitriptaline and propranolol for headache.
- **Surgical interventions** if visual functions deteriorates:optic nerve sheath fenestration- ventriculoperitoneal shunt or subtemporal decompression
- Sinus thrombosis is typically addressed by anticoagulation therapy.

Prognosis: Can be a self limited condition, but optic atrophy and blindness are the most significant complications of untreated pseudotumor cerebri.

Recommendations: Serial monitoring of visual function and optic nerve examination is essential.

Spinal muscle atrophy (SMA)

% : 2nd common NM disease after DMD.
AE→→ AR→→degeneraton & atrophy of AHC & motor nuclei of brain stem➔LMN weakness.(Degeneration is due to apoptosis 2ry to abnormal SMA gene)

Types: 3

I	**Werdnig-Hoffman disease.** ➢ Onset → Early →→may be in utero(↓ fetal movement.). ➢ Neonatal →Hypotonia, poor suckling & RD (Floopy). ➢ Later→→LMNL➔ -Hypotonia-hyporeflexia & muscle wasting except sphincters & extraoccular muscles -Fasiculations seen in the tongue. **Bulbar symptoms→→HND(هند)** **H** Hoarseness of voice+ weak cry **N** Nasal regurgitation + aspiration **D** Dy phasia,,,,, Dysarthria **NB.**→Sensation& mentality& sphincters & extraoccular muscles ➔normal. -Death →repeated chest infections ,respiratory failure (severe respiratory ms weakness).
II	**Late infantile.** ➢ Late onset & Slower progressive →→prolonged survivor till school age.
III	**Juvenile (kugleberg-wellander)** ➢ Normal in childhood & presents in the middle age. ➢ Progressive muscle weakness with very slow course involving mainly the shoulder girdle.
Faziolonde disease: ➢ varient of SMA →→ affection of motor nuclei of brain stem→→ progressive bulbar palsy.	

Investigations: Genetic analysis+

EMG	Muscular fibrillation potentials+ signs of denervation.
CK, NCV	Normal
Muscle biopsy	Denervation changes.

DD: floppy infant

TTT : supportive.
1- NICU + MV if needed
2- Physiotherapy
3- Orthopedic support
4- Psycothepapy

Torticollis

Focal dystonic condition charachterized by asymmetrical head and neck position (*twisted neck)*, it is not a diagnosis but a manifestation of a variety of underlying conditions.

DD:

1-CONGENITAL		Muscular torticollis Positional deformation Vertebral anomalies →→failed segmentation, formation or both Unilateral atlanto-occipital fusion Unilateral absence of sterno-cleido-mastoid Pterygium colli
2- Acquired	**1-TRAUMA**	1- Muscular injury (cervical muscles) 2- Subluxation→→ Atlanto-occipital, Atlant-oaxial, C2-3, Rotary. 3-Fractures (C1, others).
	2-INFLAMMATION	1-Cervical lymphadenitis 2-Retropharyngeal abscess 3-Cervical vertebral osteomyelitis 4-Juvenile idiopathic arthritis 5-Grisel syndrome→→ nontraumatic rotary subluxation of the atlantoaxial joint caused by inflammation) 7-Upper lobe pneumonia.
	3-NEUROLOGIC	1-Visual disturbances(nystagmus, superior oblique or lateral rectus paresis) 2-Dystonic drug reactions(phenothiazines, haloperidol, metoclopramide) 3-Cervical cord tumor 4-Posterior fossa brain tumor 5-Acoustic neuroma 6-Syringomyelia 7-Wilson disease
3- Others		1-Acute cervical disk calcification 2-Sandifer syndrome (gastroesophageal reflux, hiatal hernia) 3-Benign paroxysmal torticollis 4-Bone tumors (eosinophilic granuloma, osteoid osteoma) 5-Soft-tissue tumor 5-Psychogenic

	CONGENITAL MUSCULAR TORTICOLLIS (CMT)	ACUIRED TOTICOLLIS
AE	Intra-uterine deformation.	Inflammation, injury or tumours of cervical muscles cause spasm of these muscles or irritation of cervical nerves leading to torticollis.
%	Common in: first pregnancies uterine compression syndrome decreased amniotic fluid volume.	Most common causes: minor trauma,myositis,retropharyngeal abscess and cervical lymphadenitis.
C/P	-Contracture of the sterno-cleido-mastoid muscle→tilting head and neck →→side of the contracted muscle with rotation to the contralateral side. -Palpable mass in sternomastoid ms (50%) -Associated findings: plagiocephaly, facial asymmetry, and positional musculoskeletal deformities, Hip dysplasia	Hx + examin. Acute onset and the child is usually older.
Invest	Muscle biopsy MRI US.	Consultation →ophthalmologist, neurologist -XR + MRI of the brain and cervical spine
TTT	-Muscle stretching program is successful (90%) especially when started within 1st 3 mo of life. -Surgical →→persistent cases.	-Vertebral sublaxation & retopharyngeal abscess→→emergency. -Traumatic →→NSAIDs and muscle relaxants -Infections→→ Antibiotics -Ocular torticollis respond to ttt of ocular problem -GERD →→Antireflux therapy (sandifier syndrome).

Transverse myelitis

<table>
<tr><td>Def</td><td>Acute lesion affecting gray & white matter of number of spinal cord segments with no evidence of cord compression.</td></tr>
<tr><td>AE</td><td>➢ Infections➔Viral (EB-Herpes-Rubella),,,,,Bacterial(TB).
➢ Demyelinating disease.
➢ Vascular➔Anterior spinal artery occlusion.</td></tr>
<tr><td>Pathogenesis</td><td>Theories.
➢ Direct viral infection.
➢ Autoimmune vasculitis.
➢ Cell mediated immune response.</td></tr>
<tr><td>C/P</td><td>-Onset ➔Acute, preceded by Hx of viral infection (FAHM)
-Course →→progressive.
- Pain→→ back, neck.
-Nuerological :
<table>
<tr><th>Sensory</th><th>Motor</th><th>Sphincter</th></tr>
<tr><td>-Sensory level:
(mid thoracic)below it all sevsations are lost
-parasthesia(+++)</td><td>-Weakness/ paralysis
- Para or quadriplegia
flacidity→spasticity</td><td>Retention of urine.</td></tr>
</table></td></tr>
<tr><td>Investigations</td><td>➢ CSF➔↑↑ lymphocytes-normal or slightly raised proteins., ↑IgG
➢ CT & MRI➔mild fusiform swelling in the affected region.</td></tr>
<tr><td>Prognosis</td><td>-50% of cases complete recovery over weeks
- Residual deficits: bladder & bowel dysfunction, weakness of lower limbs.</td></tr>
<tr><td>TTT</td><td>- Methyl prednisolone.
-Physiotherapy.
-Bladder & bowel care.</td></tr>
</table>

Childhood epilepsy with good prognosis

1- Bg Neonatal familial convulsions	AD May be sever and resistant. Febrile and afebrile +ve family Hx.
2-Infantile familial convulsions.	AD Age →6 mons Stop → 2yrs Clusters Afebrile
3-Febrile convulsions.	In some families Febrile
4-Bg myoclonic epilepsy of infancy.	During sleep Flexor >extensors .
5-partial idiopathic with rolandic spikes	Genetic. With falling asleep / on awaking. EEG→ Focal sharp waves(centro-temporal).
6-idiopathic occipital partial epilepsy.	Early childhood During sleep. Ictal vomiting ± migraine symptoms.
7-Petit mal absence	60-80% full remission May be resistant
8-Juvenile myoclonic epilepsy	Adolescence onset Early morning myoclonic seizures Generalized during sleep Hx of absence in childhood.

Conditions that mimic epilepsy

BSCOPAN بسكوبان للمغص(3B, 5S, 2C, 4P, 1A, 4N) + بيتهز + بيترج

All →→ Neurogical exam→→ free

EEG→→Normal

3B	Breath holding attacks/ spells (pallid-cyanotic)
	Benign paroxysmal vertigo
	Benign paroxysmal torticollis
5S	Spasmus Nutans
	Stiff baby syndrome
	Sandfier syndrome
	Syncope → simple, orthostatic, cough, cvs(long QT S- AI)
	Shudders attacks
2C	Cyclic vomiting syndrome
	Chin trimbling(hereditary)
4P	Paroxysmal kinegesic chorio-acetosis(familial)
	Paroxysmal extreme pain syndrome**(familial rectal pain syndrome)**
	Paroxysmal dyskinesia
	Psychogenic epilepsy→→ Hysterical fits
1A	Alternative hemiplegia of childhood
4N	Night mares
	Night terrors
	Neonatal sleep myoclonus
	Narcolepsy & catalepsy
بيترج	Rag attacks
بيتهز	Jitterness

<table>
<tr><td rowspan="2">Breath holding spells</td><td colspan="2">• Occurs at the age between 6m-5 yrs
• Transient attacks of apnea & loss of consciousness.
• There are 2 types :</td></tr>
<tr><td>1-Cyanotic</td><td>2-Pallid</td></tr>
<tr><td></td><td>-Brief cry followed by forced expiration, apnea, and cyanosis with loss of consciousness ± myoclonus
-Return of breathing with disappearance of cyanosis & regaining consciousness within a min.
-ttt→→reassurance.</td><td>less common & triggered by head trauma, painfull stimuli→→ loss of consciousness ± tonic seizures
ttt→ atropine
may be associated with Fe ↓↓ anaemia.</td></tr>
<tr><td>Benign paroxysmal vertigo</td><td colspan="2">• Occurs in toddlers& remission after 6 yrs.
• Type of migraine
• Sudden attacks of : -Pallor ,nausea & vomiting, sweating , refusal to walk with normal consciousness
-Ataxia, nystagmus & rotational vertigo
• The attacks last for few sec to mins with out post ictal manifestations(drowsy, lethargy).
• Recur →→monthly or daily.
• Migraine→→ develops after several yrs.</td></tr>
<tr><td>Benign paroxysmal torticollis</td><td colspan="2">• Occurs at age of (2-8 month)
• Female >males= 3:1
• Sudden attacks of : -Pallor ,nausea & vomiting with normal consciousness
-Head tilt resisting passive movement.
• Variable in duration & recurrent with spontaneous remission.
• Migraine develops after several years.</td></tr>
<tr><td>Spasmus Nutans</td><td colspan="2">-pendular nystagmus head nodding & torticollis.
-MRI→→ Exclude optic chiasma trs, 3rd ventricle trs.
-Remission →→ 5 yrs</td></tr>
<tr><td>Stiff baby syndrome</td><td colspan="2">- Sudden tonic spasm allover the body→apnea→hypoxic seizures→difficult swallowing→shocking(recurrent)
- Time → day time not night.
- PPT by→→tapping nose
- delayed motor development.
-TTT→→ Clonazepam</td></tr>
</table>

Sandfier syndrome	• GERD→ sever pain→ apnea, generalized stiffness, opithitonus, staring look + minimal jrrking of extremities • ttt→ ttt of GERD
Syncope	Bradycardia, hypotension, fainting **AE:** • Simple → vasovagal attack→(fear, emotional stress) • Cough→ vigrous→↑↑ intrathoracic pressure→↓ VR→↓COP→Syncope. • Orthostatic hypotention→→sudden standing • CVS→ long QTsyndrome- AI.
Shudders attacks	• Occurs at age of (4-6month) • Flexion of→→ shoulder, head, trunk+ shivering movement • Recure→→> 100/d • Variable in duration & recurrent with spontaneous remission.
Cyclic vomiting syndrome	• Type of migraine • TTT→ anti migraine , anti epileptics
Chin trembling (Hereditary)	- AD - PPT by stress→ Involantary Chin trembling
Clonus	• Cortico-spinal tract injury • Stopped by changing position.
Paroxysmal kinegesic chorio-acetosis(familial)	- 8-14 yrs - Paroxysmal attacks of chorio-acetosis+ dysarthria. - ttt→→phenytoin.
Paroxysmal extreme pain syndrome = familial rectal pain syndrome	**-AE**: Na channel gene mutation -appear in→→ neonatal period and throughout life→(tonic attacks+ skin flush+ autonomic manifestations) - Burning pain →→ rectal, ocular areas and jaw -PPT by→→ defecation, cold wind, emotion, eating
paroxysmal dyskinesia	• Sudden attacks of choreic , mixed movements.+ sensation of fatigue/ weakness. • No loss of consciousness.
Psychogenic epilepsy→→ Hysterical fits	-Hx→ emotional stress. - onset→ gradual - asynchronized falling, limb movements
Alternative hemiplegia of childhood	• Age → 18 mons • Attacks→ flaccid hemiplegia + ipsilateral paroxysmal nystagmus± seizures. • last mins-hrs. • ↓↓ with sleep. • ttt→ flunarizine.,,Prognosis →→ataxia, developmental delay, chorio-acetosis.

Night mares	During sleep.
Night terrors	• Age →→ 5-7 years • (boys> girls). • Sudden wake up + mydriasis+ tachycardia+ tachypnea+ Walking during sleep. • The child is unaware during the attack & sleep will follow within few minutes with total amnesia at the next morning.
Narcolepsy & Catalepsy	Narcolepsy→ day time sleep upon himself + easy arousable. Catalepsy → as it + lost muscle tone.
Neonatal sleep myoclonus	Repetitive jerky movements for UL, LL during non reem sleep Remission→→ 3 yrs.
Rag attacks	• Sudden & recurrent attacks of violent physical behavior followed by fatigue & amnesia.
Jitterness(neonatal)	• Movement disorder • PPT by→→noise , touch, loud sounds. • Stopped by holding limb, removal of PPT factors.
Clonus	• Cortico-spinal tract injury • Stopped by changing position.

Febrile Convulsions

Def:

- Generalized tonic clonic convulsions that occasionally occurs at the onset of fever in acute extra- cranial infections →→tonsillitis, GE, AOM. With out metabolic disturbances and no Hx of afebrile seizures.

AE→→inherited AD / polygenic→→Na channel gene mutation.

Incidence: 3-5%

Pathophysiology:

Fever⇒↑↑the metabolic rate of cerebral neurons⇒↓↓ in seizure threshold.

C/P:

1. Patient type	**2. Seizure type**
• Age→ 5 mons -5 yrs (peak 14-18 mons) • Sex→ boys > girls • Family Hx→ +ve • Neurologically free + No features of CNS infections	• Convulsions occur at the onset of rise of temperature "≥39°c " • Generalized tonic clonic • Short duration: 5-15 min. • Course: usually one convulsive fit during the same illness. • Short post ictal drowsiness.

Clinical types:

	Simple(typical)	**Complex(atypical)**	**Febrile St. epilepticus**
Type	General tonic colonic	Focal	-Prolonged attack of convulsion or -very frequent short fits without recovering consciousness in between.
Duration	15 mins	> 15 mins	**>30**
Recure within 24 hrs	not	yes	
Prognosis	good.	Need further evaluation.	Need further evaluation.

AAP Guidelines for diagnosis:

1- **Search for cause of fever**→→ Hx, Exam….etc

2- **EEG, Neuro imaging:**

For atypical seizures and not for 1st typical.

If indicated → after ≥ 2 weeks of attack.

Not →→predict recurrence even if abnormal

3- Lumbar puncture(LP) For:
Child →→< 1yr after 1st attack to exclude meningitis
→→> 18 ms with C/P of meningitis.
→→ source of infection→OM(Not exclude meningitis).

4- Blood sugar→→ if prolonged post Ictal confusion/ poor oral intake.

Investigations:

- **Lab →**CSF if any doubt of CNS infection.
- **EEG→** if atypical febrile seizure:

♦ **Patient**	♦ **Seizures**
- Age→ < 5 mons or > 5 yrs - Family Hx of epilepsy → + ve - Development → Delayed - Neurological exam→ abnormal.	- Prolonged > 15 min - Focal. - Recurrent during the same illness

Prognosis:

- Risk for developing epilepsy →→ 1%.
- Epilepsy is diagnosed if: >5 attacks within 1 year, A single convulsion > 1 hr - Persistent EEG changes.

TTT:

- Patent airway & adequate oxygenation.
- Anticonvulsant :
  - Diazepam 0.3-0.5 mg/kg/dose→→ Rectal or IV
  - Midazolam→→ buccal / intra-nasal
  - Phenytoin →→ IV for for **Febrile St. epilepticus**
- ↓↓temperature →cold fomentation + antipyretics
- TTT of cause.
- Search for fe ↓↓ anaemia and ttt→→↓↓ recurrence, risk.
- Prophylactic anticonvulsants. Indicated for:
  - Atypical febrile seizures
  - Hx→→ recurrent febrile seizures in the parents
  - Short intervals between 1st &2nd attacks(< 3 mons)

Drugs: Na valproate or phenoparbitone (daily for 2-3 yrs)

Seizures in childhood

Def:

Seizure	Paroxysmal cerebral dysrhythmia AE➔excessive abnormal neuronal activity. Characterized by any of the following ⇒ Altered conscious level. ⇒ Abnormal motor activity. ⇒ Sensory disturbance. ⇒ Behavioral abnormality. ⇒ Autonomic dysfunction
Convulsion	Involuntary contraction of muscles due to abnormal excessive neuronal activity.
Epilepsy	Recurrent seizures unrelated to fever or any acute cerebral insult with symptom free intervals in between.
Status epilepticus	Prolonged attack of convulsion>30min or very frequent short fits without recovering consciousness in between.

Types:

Tonic	Sustained & simultaneous contraction of both agonist & antagonist muscles⇒ Rigid posturing of extremities & trunk.
Clonic	Repetitive contraction & relaxation of agonist & antagonist muscles.
Myoclonic	Sudden flexion movement.

Distribution of contraction:

Focal	involving one extremity or one side of the body with usually normal conscious level.
Generalized	involving both sides of the body & always associated with loss of consciousness.

Frequency:

- **Infrequent**→ few fits
- **Frequent** →many times

Duration:

- **Very transient** → few ss
- **Transient**→ few mins
- **Short** →5-15 mins

Etiologic classification:

<table>
<tr><th>1.Acute non recurrent convulsions</th><th colspan="2">2. Chronic recurrent convulsions</th></tr>
<tr><td rowspan="3">One or more fits that occur during the same illness and stop with improvement of the illness.
• Febrile convulsions
• CNS infections-meningitis -encephalitis-brain abscess
• IC Hge
• Strokes.
• Acute cerebral edema (GE, GN,..)
• Toxic: tetanus-post immunization (DPT) -drugs (aminophylline toxicity)
• Anoxic: sudden severe asphyxia
• Metabolic: Hypoglycemia-↓↓Ca, Mg-↓↓/↑↑Na- or hypernatremia
• First epileptic fit</td><td colspan="2">A- <u>Organic epilepsy:</u></td></tr>
<tr><td>♦<u>Non genetic</u></td><td>♦<u>Genetic</u></td></tr>
<tr><td>• Post anoxic: HIE
• Post infections
• Post hgic.
• Post toxic
• Post traumatic</td><td>-Congenital malformations: agenesis of corpus callosum.
-Chromosomal abnormalities.
-IEM
-Neurodegenerative diseases
-Neurocutaneous syndromes: tuberous sclerosis.</td></tr>
<tr><td colspan="2">B- <u>Idiopathic epilepsy</u>
C- <u>Epileptic syndromes</u></td></tr>
</table>

Idiopathic epilepsy

<table>
<tr><th>1-Partial seizures</th><th>2-Generalized seizures</th></tr>
<tr><td>1. Simple (normal conscious level)
o Motor
o Sensory.
o Psychic
o Autonomic.
2. Complex
3. Partial (simple or complex)with secondary generalization.</td><td>1. Absence (petite mal)
o Typical.
o Atypical.
2. Tonic clonic (Grand mal)
3. Myoclonic.
4. Atonic.</td></tr>
<tr><td colspan="2">3-Unclassified seizures</td></tr>
</table>

Epileptic syndromes

1. Infantile spasms.
2. Benign myoclonus of infancy.
3. Lennox-Gastaut syndrome.
4. Benign childhood epilepsy with centrotemporal spikes
5. Juvenile myoclonic epilepsy.

I-Partial seizures

1. **Simple partial :**attacks of
   - Twitching or jerking of one side of the face, arm or leg.
   - Consciousness is usually retained.
   - May proceed to a generalized tonic clonic seizure with loss of consciousness.
   - Weakness of the involved side.
2. **Complex partial :**attacks of
   - Impaired consciousness, usually without falling associated with
     A. Strange sensations: may be visual, auditory, olfactory, loss of realty, fear or sadness.
     B. Complex purposeless movements (Automatism) as chewing, swallowing or running.
   - The attacks last for few minutes.
   - EEG shows abnormal electrical discharge from temporal lobe.

II-Generalized seizures

1. **Absence(petit mal)** attacks of
   - Impaired consciousness without falling or involuntary movements.
   - Cessation of motor activity or speech with blank facial expression (5-20) seconds then continues his original activity as if nothing had happened.
   - The attack can be triggered by hyperventilation.
   - EEG: 3/ sec spike & wave discharge.
2. **Tonic clonic (Grand mal)** attacks of
   - Sudden loss of consciousness & falling.
   - Tonic phase➔limb extension arched back, cessation of breathing & cyanosis.
   - Clonic phase➔repeated contraction & relaxation of muscles salivation, micturition & defecation may occur.

- Post ictal➔deep sleep for hours (Todd's paralysis) then consciousness is regained.
- Clonic phase lasts for few minutes but if continues more than 30min it is known as status epilepticus.

3. **Myoclonic seizures.**
   - Attacks of sudden brief, often symmetrical muscular contractions (flexion or extension) involving one group of muscles with falling & tendency to cause injuries to the face or the head.
   - It may be idiopathic or symptomatic as in degenerative brain disorders (more common & associated with MR & abnormal neurological findings.
   - Types include :
     -Benign myoclonus of childhood

     -Complex myoclonic epilepsy (poor prognosis).

4. **Atonic seizures.**
   - These attacks start, without warning by a synchronous increase in muscle tone or brief myoclonic jerking followed immediately by loss of postural tone & falling to the ground.

Epileptic syndromes

1. **West's syndrome (infantile spasms)**
   - Seen in infants 4-8 months
   - Attacks of sudden symmetric contractions (flexion usually) of the neck, trunk, & extremities that occur in clusters (minutes) several times per day.
   - It starts at sleeping or just on awakening.
   - 80% have underlying neurological disorder as HIE.
   - Usually associated with MR.
   - EEG shows hypsarrhythmia.
   - Dramatic response to corticosteroid & vigabatrin.
2. **Benign myoclonus of infancy**
   - Onset at infancy with normal development.
   - Clusters of myoclonic convulsions confined to the neck ,trunk & extremities.
   - EEG is normal.
   - Prognosis is good as it improves at the age of 2 years with no treatment.
3. **Lennox Gastaut syndrome.**
   - Age of onset :3-5 years with delayed developmental milestones &MR.
   - Multiple types of seizures(Tonic, Clonic & Myoclonic)

- EEG shows diffuse slow spike & wave complexes.
- Prognosis is poor.

4. **<u>Benign childhood epilepsy with centrotemporal spikes</u>**
    - Age of onset 4-10 years with normal developmental milestones.
    - Partial (facial & extremities) brief motor seizures related to sleep.
    - EEG: centrotemporal spikes.
    - Treatment of choice is carbamazepine.
    - Prognosis is good
5. **<u>Juvenile myoclonic epilepsy.</u>**
    - Age of onset: 12-18 years with normal developmental milestones.
    - Frequent myoclonic jerks on awakening or with sleep deprivation.
    - Generalized tonic clonic seizures will develop in the next few years.
    - EEG shows irregular spike & wave pattern.
    - Prognosis is good with dramatic response to sodium valproate.

Status epilepticus

Definition:

- Clinical seizures or EEG activity ≥ 30 mins Or intermittent over 30 mins with out full conscious return.

AE:

1. New onset epilepsy.
2. CNS→ infections, post-encephalitis, ICH, ↑↑ IC pressure.
3. Febrile convulsions.
4. Sleep deprivation.

Types:

1- Convulsive→→ general TC + Autonomic manifestations(tachycardia, respiratory compromise, ↑↑ secretions)
2- Non Convulsive→→ absent or partial seizures.

AE classification:

1. **Prolonged febrile seizures.**

2. Idiopathic status epilepticus:	3. Symptomatic status epilepticus:
1-New onset epilepsy. 2-Sleep deprivation. 3- Antiepileptic drugs: ➔Sudden withdrawal ➔Irregular therapy ➔Intolerance 4- Infections.	1- Toxins→ Lead. 2- Drugs→ TCA. 3- Metabolic→↓↓ (glucose, Vit B6, Na, Ca, Mg),,,,↑↑(glucose→DKA). 4- Syndromes → Ryes S 5- CNS→ infections, post-encephalitis, ICH, ↑↑ IC pressure.

Clinical classification:

1. Generalized →→ TC (+++)
2. Partial.

Pathophysiology

- ↑↑ electrical activity due to either
  - ↑↑ Cell membrane excitability due to abnormal ionic conductance of Ca, Mg & K.
  - Abnormal neurotransmitter release :
    - ↑↑ Excitatory.
    - ↓↓ Inhibitory.
  - Abnormal postsynaptic receptors
    - ↑↑ Excitatory.
    - ↓↓ Inhibitory

    All lead to failed:

    1- Desensitization of exitatory glutamate receptors→→ contious exitability.
    2- Sensitization of inhibitory GABA receptors→→ contious exitability.

Changes occurring with prolonged convulsions

1. **Electromechanical changes:**
   - Electromechanical dissociation (continued electrical activity with no motor response) in fits > 1 hour.
2. **Cerebral changes:**
   - During the fit: ↑↑ cerebral O_2 consumption to 300%
     ↑↑ Blood flow to 900%
   - In prolonged fit or short frequent fits➔cerebral ischemia , edema & hemorrhage, necrosis, apoptosis.
3. **Systemic changes:**
   - Respiratory➔apnea, cyanosis, airway obstruction & pulmonary edema.
   - CVS➔hypotension, HF, shock & cardiac arrest.
   - Metabolic➔Fever, metabolic acidosis & hypoglycemia.

Causes of death : Airway obstruction –Apnea- Cardiac arrest-HF

Evaluation of a case of seizure

1- **Hx:**	2- **Exam:**	3- **Investigations**
-Perinatal. -Neonatal: HIE-trauma-hge-meningitis. -Family: previously affected sibling.	-General: odd features-FTT-abnormal odor➔neurodegenerative or IEM. -Neurological: Meningeal irritation signs-↑↑ICT-motor weakness-MR -Skin: Neurocutaneous syndromes (discus)	-Blood glucose, Ca& Mg for all cases. -Metabolic screen→IEM -CT& MRI→cerebral malformations -brain atrophy-Neurocutaneous& neurodegenerative diseases (in cases with MR & motor deficits).

Management:→→ Medical emergency:

- **Immediate measures**
  A. Open airway.
  B. Position→ recovery position.
  C. CVS→ Monitor & asses.
  D. O2→→ correct hypoxia.
  E. IV line, IVF→to correct shock & give anticonvulsants.
  F. Venous blood→→asses AEDs level, CBC, BUN, Electrolytes, glucose.
  G. ABG.

- **<u>Anticonvulsants</u>**

  IV:

  1- Lorazepam or intra-nasal (0.05-1mg/kg over 5 min)
  2- **Diazepam➔**0.5 mg/kg slow IV or rectal (if no response within 10 min)
  3- **Phenobarbital➔**15-20 mg/kg slow IV
  4- **Phenytoin➔**15-20 mg/kg slow IV

  *If:

  1- Controlled→→ long acting AEDs→→ to prevent reccurence.
  →→ regular follow up and asses(clinical, lab)

  1- No response →→→ICU

- **<u>ICU</u>** →→MV is mandatory
  1. **Diazepam infusion➔**0.2-0.3mg/kg/hr Or 2-3mg/hr practically one ampoule of diazepam (10mg/2ml) is added to 200ml saline so that 1mg/20ml & the infusion rate will be 40-60 ml/hr.
  2. **Midazolam infusion➔**0.1-0.2mg/kg loading dose followed by constant infusion 0.05 mg /kg/hr more potent than diazepam & causes conscious sedation (Dormicum amp 5mg/ml)
  3. **Phenobarbital➔**high doses up to 60mg/kg.
  4. **Second line anticonvulsants**
     - **Paraldehyde**
     - **Lidocaine** (1gm/50ml): 1-2mg/kg slow IV followed by infusion 2mg/kg/hr it may cause hypotension & heart block so monitoring of blood pressure &ECG is mandatory.
     - **Thiopental** (Intraval 500mg/10ml): 2-4mg/kg IV followed by infusion 2mg/kg/hr, it may cause hypotension so monitoring of blood pressure is mandatory.
  5. **General anesthesia in resistant cases.**

Neuropathic pain

Pain result from→→ (injury/ inflammation/ dysfunction) of PNS/CNS:

Ch by: proximal or distal and corresponding to innervation pathway +

1- Spontaneous.
2- Burning.
3- Parasthesia→→pins, needles.
4- 2 Hyper→→ algesia→→amplification of anoxious stimuli
→→pathia→→ wide spread response to anoxious stimuli.
5- Allo-dynia→→ pain in response to non painfull stimuli.

Examples (AE);

PNS		**CNS**
Focal / multifocal neuropathy	**Polyneuropathy**	
a- Neuralgia: -Post→→herpetic, traumatic) -Cranial→→ tri-geminal, glossopharyngeal **b- Neuropathy:** -DM -Mg. -2I→→ Ischemia, irradiation.	**-Metabolic**→→DM, Hypotyriodism. **-Nutritional**→→Beri-Beri, pellagra. **-Drugs**→→ INH, Anti-retroviral. **-Toxins**→→ alcohol, pelatinum. **-Infection(auto-immune)** →→ HIV, Gullian-BarreS. **- Mg** **-Idiopathic.** **-Hereditary.**	**2Complex**: 1-neuropathic disease. 2- regional pain S **4S**: 1-Spinal→→trauma, injury, disc. 2-Stroke→→infarction. 3-Sclerosis→→ multiple 4-Surgical→→ cordotomy.

TTT:

Drugs		**Stage**
1-Anti-depressant(TCA, Seretonin reup take ↓↓)		1^{st} , 2^{nd} .
2-Anti-convulsants	Pregabaline	1^{st} , 2^{nd} .
	Gabapentin .	
	Lamotrigine	2^{nd} .,3^{rd} (after stroke)
	Valproate	3^{rd}
3-Opiods		
4-Others	Cannabinoids	2^{nd} (Multiple sclerosis)
	Mexilatine	3^{rd}

Neuro-cutaneous syndromes

Heterogenous group of disorders characterized by involvement of CNS & skin →→ ↑↑ tumors.

AE→→defect in the differentiation of primitive ectoderm.

Types:

Genetic	AD	Tuberous sclerosis Neurofibromatosis Von Hippel lindau
	AR	Ataxia telangiectasia Refsum disease
	XLD	Incontenetia pigmenti.
Non genetic		Sturge weber disease Linear nevus syndrome

	Von –hippel lindau disease	**Refsum**
Pathology	•AD • Retinal angioma • Cerebellar hemangioblastoma.	•AR • VLCFA(Very Long Chain Fatty Acids) storage disease (phytanic acid)
C/P	• Ataxia • Retinal detatchement →visual loss.	•Ataxia •Rentiitis pigmentosa • Peripoheral neuropathy •Icthyosis
TTT	1. Symptomatic 2. Genetic counselling.	

Tuberous scelerosis:

Pathogenesis		-AD (50% of cases are sporadic) • Tubers(Neurons & proliferated astrocytes) in subependymal region projecting into ventricular cavity(may obstruct foramen of monro ➔ hydrocephalus)→→calcification
C/P	**1. Cutaneous**	• Hypopigmented skin lesions (ash leaf)→90% of cases & present at birth on the trunk & limbs. • Sebaceous adenoma→pathognomonic & appear at the age of 4-6 years , small bright red nodules on the nose & cheeks (acne like) they may coalesce & assume fleshy appearance. • Shagreen patches→Rough , raised indurated areas in the lumbosacral area.
	2. Neurological	• Convulsions→infantile spasms then generalized seizures later. • MR • Trs →→less common.
	3. Others.	• Heart→Rhabdomyoma➔arrhythmia & HF • Renal→ Polycystic kidney➔Pain ,hematuria & RF • Lung→ Cysts➔spontaneous pneumothorax. • Eye→→Retinal lesions
Investigations		**1. CT & MRI**→Calcified tubers in periventricular area(at 3-4 yrs) cotton ball appearance may be in cortex & basal ganglia **2. ECG, Echo, sonar ,EEG & fundus**.
TTT		1. Symptomatic 2. Genetic counselling.

Neurofibromatosis :

Pathogenesis		-AD (50% of cases are sporadic) • Abnormal differentiation & migration of neural crest during embryogenesis
Types		• I→90% • II→10% (+Bilateral acoustic neuroma+ ➔headache hearing loss & disequilibrium ± facial weakness&less common cutaneous manifestations)
C/P NFI	**1. Cutaneous**	• **Café–au-lait spots→**100% of cases (5 spots> 5mm). ⇒Present at birth &↑↑ in number & size & pigmentation during 1st yrs. • **Axillary & inguinal fleckering→** multiple hyperpigmented areas (2-3 mm). • **Iris lisch nodules→** ≥ 2 • **Neurofibromas→** Appear in late childhood. - Site→→skin , SC tissue & viscera along the caurse of peripheral nerves - Ch by→→soft nodule along the caurse of nerve & blood vessels +purplish discoloration of the overlying skin •**<u>Plexiform neurofibroma</u>:** -diffuse thickening of nerve trunk →→significant disfigurement - Overlying skin→→hyperpigmented
	2. Neurological	• Optic glioma. • Convulsions • Hemiparises(occlusion of cerebral vessels due to neurofibroma). • MR→→learning disabilities & psychological disturbances. • Trs→→astrocytoma ,meningioma.
	3. Others.	• Bones →Kyphosis ,scholiosis dysplasia of wing of sphenoid ➔ pulsating exophthalmos • Mg→Neurofibrosarcoma, leukemia, wilms &pheochrocytoma
Investigations		• CT, MRI & EEG • Skeletal survay • Audiogram • Visual evoked potential • Slit lamp
TTT		1. Symptomatic 2. Genetic counselling.

Nongenetic disease (sporadic).			
		Sturge weber disease	**Linear navus syndrome**
Pathogenesis		• Abnormal development of vascular bed: - Face, meningies →rich vascularization - Brain →poor vascularization ⇒atrophy	
C/P	**1. Cutaneous**	• At birth↑ Unilateral facial nevus in the upper face & upper eye lid present (port wine hemangioma)	• Midline facial nevus faint during infancy➔yellowish brown &hyperkeratotic
	2. Neurological	• Convulsions → contralateral to the nevus, focal tonic clonic & refractory to anticonvulsants. • Hemiparesis→ contralateral to the nevus. • MR→seizures & brain atrophy	• Seizures • MR
	3. Others.	• Buphthalamus(congenital glucoma) of ipsilateral eye • Trs→ Angioma of cerebral cortex	
Investigations		**1. XR Skull** →→serpentine calcification (railway appearance) in occipitoparietal area (unilateral) **2**. **CT**→→ brain atrophy **3**. **Intraoccular pressure**→→ glucoma	**CT**→→ Normal in most cases
TTT		**1. Neurological**→→control convulsions, physiotherapy & lobectomy **2. Cutaneous**→→ laser **3. Others**→→ follow up of IOP	Symptomatic

Infantile spasms/Epileptic spasm
(West's syndrome)

-Age→→ 1ST year→→ (4 -7 mons).
- Generalized seizures→→ Rapid, brief flexion of → neck, back and extremities.
-Lasts for→→ 5-10 secs followed by→→ relaxation for 0.2-2 sec.
-Attacks occur in clusters→→lasts between < 1min- from 10-15 min.
-The infant often cry →→painful.
- Occur at any time throughout the day(More common before sleep and upon awakening from sleep)
-Prognosis→→ developmental arrest or regression.

AE:

1- Idiopathic 2- Prenatal→→ infections(TORCH), Malformations(cortical dysplasia) 3-Perinatal→→ HIE 4-Postnatal→→ Trs, Trauma. 5-Tuberous sclerosis 6-IEM 7- Benign myoclonus of infancy.	
West's syndrome:	Benign myoclonus of infancy:
-Triad of infantile epileptic spasms -Occur in clusters -Developmental regression - EEG →→ hypsarrhythmia.	-Clusters of myoclonic convulsions confined to the neck, trunk & extremities. -Onset at infancy with normal development. -EEG→→normal. -Prognosis→→good as it improves at the age of 2 yrs -TTT→ need no TTT.

Diagnosis:

EEG	hypsarrhythmia→→ high amplitude spikes and waves on disorganized background.
CT MRI CBC URINE Sr. glucose, Ca	

TTT:

Drug of choice	adrenocorticotrophic hormone (ACTH).
Then	Vigabatrin, steroids

Chorea

Definition:

-Extra-pyramidal disease affecting BG.

characterised by:

- Rapid,dysrhythmic , jerky, irregular, involuntary, semipurposeful coarse movements involving muscles →→ face , limbs and trunk. ↑↑ by activity and excitement ↓↓ by sleeping.

AE:

1- Acute chorea

1)Rheumatic chorea (Autoimmune)
2)Inflamatory(Infectious) eg post encephalitic
3)Toxic chorea eg.INH-Reserpine -Chloropromazine
4)Traumatic
5)Brain tumors.
6)Familial paroxysmal choreoathetosis
7)Hypernatrimic dehydration

Rheumatic chorea

It is one of major criteria of **rheumatic fever.**	
C/P	**Onset: Emotional disturbances and lability**, and starts after resolution of arthritis and carditis (acute stage) **Choreiform movements**: How to elicit**?** Darting tongue, inability to maintain the tongue protruded. Buttoning test. Arm extension test, piano playing movements. Arm elevation test, pronation. • **Hypotonia**: →Flaccidity. →Hyporeflexia and hanging knee jerk. →Milk maids grip (squeeze and relaxation) →Boat shaped hand (flexion of wrist and hyperextension of metacarpophalyngeal joints). • **Disturbed gait, speech and writing.**
Types	1-Classic 2-chorea gravis(severe form) 3- chorea mollis(paralytic) 4-Hemichorea
Investigations	as for rheumatic fever
TTT	-Haloperidole: 0.02 mg/kg/day. -Chlorpromazine: 2 mg/kg/day. -Phenobarbitone: 2 mg/kg/day

Familial paroxysmal chorea:

- AD
- transient episodes of chorioathetosis lasting secs - few Mins.

Chronic chorea

1-Extrapyramidal CP:		-Usually post kernicteric, -Non progressive -Onset→→ late infancy&early childhood
2-Brain tumours:		↑↑ ICP
3-Metabolic*:*	**Lesch nyhan**	IEM of purine metabolism : ↑↑uric acid, MR, self mutilation, Choreoathetosis & nephropathy.
	Wilson disease*:*	-AR -abnormal deposition of Cu in CNS .
4-Herido-degenerative:	**Huntington's chorea**	-AD(rare) -Degeneration of →→ BG, cerebellum, & frontal lobe⇒ Chorea, dystonia ,rigidity, nystagmus, seizures & mental deterioration.
	Ataxia telangectasia	see before.

Other abnormal movements

1-Athetosis	Involuntary slow writing or snake like movements of the distal extremities usually occuring with chorea.
2-Dystonia	-Involuntary slow twisting movements of proximal parts of extremities , trunk & face with hypertonia during movement & normal tone in between. -Etiology: perinatal asphyxia-metabolic-degenerative -Dystonia muscularum deformans : AR or AD - Tip toe walking with progressive dystonia later on
3-Tics	-Rapid , repetitive, stereotyped movements involving facial muscles , neck & shoulders & ↑↑ emotional stress it may be o Transient disorder of childhood. o Chronic. o Gilles de la tourette syndrome➔multiple tics .
4-Tremors	-Rapid rhythmic movements involving the hands & may be o Static➔ fine as in anxiety & thyrotoxicosis Flapping in liver cell failure. o Kinetic➔Ataxia.
5-Myoclonus:	-Sudden contractin of group of muscles➔quick limb movement

Bell's palsy

Def		Acute isolated facial nerve paralysis.
AE		Post infectious immune response.(2 wks after HSV, HZV)
C/P	**2Absence**	1-Forehead wrinkles. 2- Nasolabial fold.
	Unable to	1-Raise eye brow. 2-Close the eye→ exposure keratitis. 3- Whistle 4- Show the teeth
	2D	1- Deviation of the angle of the mouth →→ healthy side. 2- Drippling of saliva .
D.D		1- Cong. Facial nerve palsy, absent facial nucleus. 2-Trs →→neurofibroma, cerebello pontine angle. 3-Trauma→→ birth injury 4-Infarction.
TTT		Prednisolone : 1ng/kg/day for 1 wk →↓↓gradually. Eye protection: Antiviral→Acyclovir Physiotherapy for chronic cases.
Prognosis		Complete recovery (85%) Mild weakness(10%) Severe weakness(5%)

Chronic pain

Recurrent or persistent pain lasting > the normal tissue healing time(3-6 mons).

AE:

injury →burns.

chronic disease →cancer, arthritis.

Others →→neuropathic pain, fibromyalgia, **CRPS,** functional abdominal pain.

childhood→abdominal, musculoskeletal, and headache pain(+++)

COMPLEX REGIONAL PAIN SYNDROMES (CRPS) Neuropathic pain :

-Abnormal excitability in the peripheral or CNS that may persist after an injury heals or inflammation subsides.

-AE:post-traumatic and postsurgical peripheral nerve injuries, pain after amputation, pain after spinal cord injury, and pain caused by metabolic neuropathies.

- Acute or chronic

-Ch→→ burning or stabbing ±cutaneous hypersensitivity (allodynia), distortion of sensation (dysesthesia), and amplification of noxious sensations (hyperalgesia and hyperpathia).

-%→ >35% of referrals to chronic pain clinics,

- Typically responds poorly to opioids.

- TTT →→TCAs and anticonvulsants.

Type 1 (reflex sympathetic dystrophy).	**Type 2**
Typically follows previous minor injury to an extremity without identifiable nerve injury. -includes: Severe spontaneous neuropathic pain. Hyperpathia Hyperalgesia Allodynia to touch and cold changes in blood flow (typically extremity cyanosis), and sweating. In more advanced cases, symptoms include dystrophic changes of the hair, nails, and skin, immobility of the extremity (dystonia), and muscle atrophy. In the most advanced cases, symptoms include ankylosis of the joints of the extremity.	As type 1 except that the former is associated with a well-defined peripheral nerve injury.

TTT:
-Physical therapy
- Cognitive-behavioral therapy
-Nerve blocks→ sympathetic nerve blocks, IV regional anesthetics, epidural analgesia, and peripheral nerve blocks.
-Drugs→→ AEDs , TCAs.
-Surgical sympathectomy and spinal cord stimulation→ for sever cases..

Congenital myopaties

- A group of congenital muscle diseases caused by abnormalities during embryonic development of muscles.
- Some of them are fatal while others are non progressive.
- May be genetically determined or sporadic.
- **Characterized by** :
    1. Hypotonia & hyporeflexia.
    2. Muscle wasting specially limb & trunk.
    3. Joint contracture.
    4. occular ,facial & respiratory weakness.
    5. Diagnosis by muscle biopsy
    6. CPK ,EMG, NCV→normal.
- **Types**:

Fatal:	Benign
Respiratory weakness →→failure. 1. Myotubular myopathy. 2. Congenital muscle fiber type disproportion. 3. Severe form of nemaline myopathy.	1. Central core type. 2. Multicore type. 3. Nemaline myopathy.

Muscular dystrophies

Definition:

- Primary muscle diseases of genetic base characterized by progressive degeneration of muscle fibers with replacement with fat & fibrous collagen tissue.

Classification:

- Pelvic girdle
    - Pseudohypertrophic type as Duchenne & Becker.
    - Atrophic type.
- Shoulder girdle.
    - Scapulohumeral (Emry- Dreifuss)
    - Facioscapulohumeral(Landouz-Dejerine)
- Limb girdle type
- Myotonic dystrophy.
- Congenital muscular dystrophy.

Duchenne muscular dystrophy(DMD)

Etiology:

- XR…… 30% new mutations
- Defect in dystrophin gene.

Clinical manifestations:

- **Onset** : During the 1st 5 years with slowly progressive course.
- **Complaint**
  - Normal or slightly delayed motor development.
  - Difficulty in getting upstairs-in getting up from recumbant or sitting position up to difficulty in standing & walking.
- **Examination** :

A-Neurological

1. **Motor system**
   - ♦ State➔Psuedohypertrophy of some muscles as calf forearm, deltoid &tongue –Atrophy of others as thigh muscles.
   - ♦ Tone ➔Hypotonia.
   - ♦ Power➔Weakness; symmetrical –Proximal>distal

   Demonstrated by
   - Gower sign→The patient climbing himself when getting up from sitting due to weakness of gluteus maximus.
   - Waddling (trendlenberg) gait→Due to weakness of gluteus medius & minimus(abductors of the thigh).
   - Exaggerated lumbar lordosis on standing→To compensate for weakness of glutei.
   - Slipping sign→Weakness of shoulder muscles.
2. **Reflexes**: Hyporeflexia in late cases.
3. **Sensory** : Normal
4. **Mentality**: MR in 25% of cases.

B-Other systems

1. Scoliosis &pes cavus.
2. Cardiomyopathy.

- **Causes of death**.
  1. Respiratory infections or failure.
  2. Congestive heart failure.

Investigations

- ♦ **Lab**➔CPK shows marked elevation> 10 folds
- ♦ **EMG**➔Myopathic pattern

- **NCV➔**Normal
- **Echo &ECG.**
- **Muscle biopsy➔**Degeneration muscle fibers with infilteration & replacement by fat & fibrous collagen tissue.
- **Prenatal diagnosis ➔**DNA studies for carrier detection.

Treatment

- Supportive –physiotherapy.
- Definitive treatment:
  1. **Myoblast transfer➔**from HLA matched donor to be injected in the damaged muscles to replace degenerated fibers.
  2. **Gene therapy➔**recombinant dystrophin gene.
  3. **Prednisone➔**↓↓appoptosis & ↓↓ degeneration of muscle fibers.

Becker dystrophy

XR ,late onset during late childhood very slow progressive course & long time of survival till 4^{th} decade.

Disorders in neuromuscular transmission

- Myasthenia gravis.
- Botulism.
- Tick paralysis.

1-Myasthenia gravis

Definition: Easy & rapid muscle fatigue on repitition of movement.

AE:

- Autoimmune disorder(+++).
- Familial AR (rare).
- Transient neonatal myasthenia: maternal myasthenia→→transplacental passage of Abs to fetus.

Pathogenesis: Auto-antibodies against acetyl choline receptors.

Clinical manifestations:

I-Neonatal	II-Juvenile
♦ **Transient neonatal myasthenia**: • Cause: Maternal Abs →↓↓ 2-4 wks. • C/P: Generalized hypotonia(floopy infant) weak suckling shallow breathing. • TTT: anticholinestrases &MV • Prognosis:complete cure ♦ **Familial myasthenia** : (rare). -AR(abscent receptors) - No antibodies. -permanent disease	♦ Females > males (ratio 6:1) -age >10 years. ♦ Muscle weakness more at the end of the day(diurnal variation) with descending march: 1. Ptosis is the earliest sign (diplopia in the older). 2. Bulbar & facial muscles➔هند→hoarsness, nasal regurge, dysphagia, dysarthria. 3. Skeletal muscles. ○ Proximal > distal UL> LL. ○ Hypotonia & Hyporeflexia. ○ The patient may be unable to raise his head from surface of the table. ○ Respiratory muscle affection may occur (fatal). ○ No fasciculations or muscle wasting. 4. Sensations are normal. 5. Myasthenic crisis→severe life threatening exacerbation due to stress or infection.

Investigations :

1. **Clinical test:**
    - IM neostigmine (plus atropine) 0.04-0.08 mg/kg ⇒maximum effect within 20-40 min⇒improvement of ptosis.
    - Edrophonium can be used instead(rapid onset of action improve ptosis within 10 secs).
2. **EMG:** ↓↓↓ amplitude of motor unit potential after repetitive stimulation
3. **CK, NCV:** normal.
4. **Labs:** detection of antibodies, ANA, thyroid function..
5. **Imaging:** chest x-ray →enlarged thymus.
6. **Muscle biopsy**→non specific.

TTT :

1. Choline esterase inhibiting drugs:
    - Neostigmine →oral or IM 0.04 mg\kg every 4-6 hours.
    - Pyridostigmine(longer acting)→30mg\kg\4hours ↑↑ dose gradually till weakness immproves or muscarinic symptoms appear (lacrimation-salivation-cramps & bradycardia)
2. Steroids, IVIG
3. Plasmapharesis.
4. Thymidectomy

NB→ avoid aminoglycosides& NM blockers

Botulism

Causative organism	• Cl. botulinum→Exotoxin producing gram +ve anaerobe.
Source	• Home canned foods specially honey, corn syrup.
Mode of transmission	• Ingestion of contaminated food • Wound cotamination
Pathogenesis	• The exotoxin prevents the release of acetyl choline in the nerve endings⇒blockage of NMT in both 1. Skeletal muscles. 2. Autonomic nerves.
C/P	• Age →2mo-2y. • Hx • Prodroma→Poor feeding –constipation. • Progressive bulbar(هند) & skeletal muscle weakness (LMN)within 4-5days • Typical features include: 1. Conistipation . 2. Generalized muscle weakness. 3. Ptosis. 4. Dysphagia. 5. Weak cry. 6. Dilated pupils with sluggish reaction to light. • Course→Self limited & usually last for 2-6 weeks with complete recovery & relapses in 5% . However life threatening paralysis & sudden death may occur in few cases.
DD	○ Myasthenia gravis. ○ SMA. ○ Guillain-Barre.
Investigations:	• **EMG**→short duration ,low amplitude motor unit. • **Lab**→isolation of organism in stools. • **CK, NCV**→ normal.
TTT	1. Antitoxin. 2. Hypotonia →→ ICU + MV as sudden apnea is a possible & constant danger. 3. Nutritional support. (Avoid Gentamicin ⇒Presynaptic neurotransmitter blockage)

Tick paralysis

Pathogenesis	The tick embeds its head into the skin (scalp)⇒ Neurotoxin →→Blockage of acetyl choline release (large myelinated motor & sensory nerves).
C/P	appear after 5-6 days in the form of • Motor ➔ascending weakness of LMN • Incoordination. • Sensory ➔tingling & paresthesias.
Invest	EMG- Nerve conduction studies- Identifying the tick.
TTT	Removal of the tick specially its head ⇒ complete recovery.

Myotonic dystrophy

Etiology: AD with multiorgan dysfunction.

Clinical manifestations:

- **Neurological**
  - Neonatal ➔generalized hypotonia with poor feeding &respiratory muscle weakness →→RF
  - Later on➔
    1. Wasting :
       *Early facial ⇒inverted V shaped upper lip concave cheek & temporalis-high arched palate.
       *Other muscles⇒Distal>proximal.
    2. Hypotonia & weakness: distal > proximal
    3. Myotonic phenomenon.(After 5 years)

       Slow relaxation of muscles after voluntary contraction whether the contraction is induced voluntary, mechanically or electrically.
    4. Reflexes: Preserved
    5. Speech: poor articulation
- Intelligence: intellectual impairement (50%).
- **Systemic manifestations.**
  - **CVS➔**Arrhythmia
  - **GIT➔**slow gastric emptying & constipation
  - **Endocrine➔**DM-precocious or delayed puberty-testicular atrophy-adrenocortical insufficiency.
  - **Eye➔**cataract.
  - **Immune defeciency**.

Investigations

- **Lab➔** CPK normal
- **EMG➔**classic EMG changes
- **Muscle biopsy**
- **For the associated disorders**

Treatment :

- Supportive.

Myotonia congenita	AD or AR Slowly progressive Generalized musle psuedohypertrophy
Congenital dystrophies	AR Floppy infant Severe muscle wasting Joint contractures Biopsy is diagnostic.
Inflamatory muscle diseases	▪ Infectious myositis ➔ Viral(cox& influenza),,,,,Bacterial Parasitic(toxoplasma –trichinosis) ▪ Others ➔ Dermatomyositis Polymyositis Myositis ossificans
Endocrinal myopathies	▪ Hypothyroid –hyperthyroid. ▪ Steroid induced myopathies.
Metabolic myopathies	▪ Glycogen storage disease type V &VII. ▪ Lipid myopathy. ▪ Vitamin E deficiency. ▪ K related periodic paralysis.